

REMARKS

Upon entry of the present Amendment-B the claims in the application are claims 1 and 3-12 of which claims 1, 5 and 6 are independent. Claims 1, 5-7 and 10 are amended herein.

Applicant respectfully submits that all of the above amendments are fully supported by the original application, including the original claims. Applicant also respectfully submits that the above amendments do not introduce any new matter into the application.

The claims have been amended to more clearly define the subject matter which applicant regards as his invention. No new matter is added to the application and the amendments are fully supported by the original disclosure.

The above-identified Office Action has been reviewed, the applied references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment-B is submitted. It is contended that by the present amendment, all bases of objection and rejection set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the objection and rejection is respectfully requested.

Claim Objections

At item 1 of the Office Action, the Examiner objected to claim 1 due to informalities therein. In particular, the Examiner states that the abbreviations "SCM", "SKD", and "SKH" are not supported or defined in the claim. The applicant has amended claim 1 herein to recite that the abbreviations are steel designations as designated by the Japanese Industrial Standards.

The claimed reference to Japanese Industrial Standards is supported in paragraph 2 of the specification, and in addition, these standards are well known and easily recognized in the art. By this amendment, the objection to claim 1 is obviated.

Claim Rejections – 35 USC 103

At item 4 of the Office Action, the Examiner rejected claims 5-12 under 35 USC 103(a) as being unpatentable over Righi in view of either CN2180362Y or Kumpula. In the rejection, the Examiner states that Righi discloses the die and method of manufacture thereof comprising use of a main die body 2 including gate 6 and having a wall surface for defining a mold cavity and a cavity forming member or an insert die (heat exchange insert 30) disposed or embedded at a location in a recess near the gate, the die main body and insert die are made of steel, and the insert having welded part facing and forming part of the mold cavity, such as the outer shell 110.

The Examiner further states that Righi fails to teach the use of better steel for the insert, and cites CN '362Y for a teaching of use of better steel for the insert die (inner sheath 2), made of more high temperature resistance and high strength compared to the main body for the purpose of effectively reducing the hot corrosion and stress impact due to the casting molten steel. In an alternative rejection, the Examiner cites Kumpula for a teaching of using a better steel such as maraging steel as a mold steel for the purpose of effectively improving the thermal stability and mechanical properties of die parts. The Examiner considers it obvious to modify the Righi to use better steel for the insert as taught by CN '362Y or Kumpula in order to effectively reduce hot corrosion and stress impact due to casting of molten steel.

Applicant's Response

Upon review of Righi, the applicant finds that Righi discloses cooling insert for use in a die casting mold, the cooling insert disposed within the mold to provide wall portions of the mold at locations at which the casting is relatively thick. The cooling insert comprises a hollow core through which cooling liquid flows whereby the thick portion of the casting is cooled more quickly due to heat exchange between the casting body and the wall of the cooling insert.

As presented in the English language translation of the Office Action provided by the Chinese Patent Office, it appears that CN2180362Y discloses a steel ingot die having a die body 1, a die cavity formed in the die body, and an inner sheath 2 provided in a groove formed at “the heavily

scoured bottom” of the die body 1. According to the translation of the Office Action, the inner sheath is formed of a material which is more high temperature resistant than is the material used to form the main body 1.

The applicant respectfully disagrees that the disclosure of Righi as modified by CN ‘362Y makes obvious the invention claimed in claims 5 and 6, since there is no motivation for such a modification. The applicant submits that Righi discloses using the same materials for both the insert and the die body (col. 7, lines 13-20), and further submit that the insert of Righi is not used for damage prevention, but is instead used for cooling portions of the casting which are relatively large in thickness. As such, the insert of Righi is not disposed at the gate of the die body, but instead is arranged within the die body at a location of relative thickness, as determined by the casting shape. Because the insert of Righi is used for cooling, and thus may be disposed at a location far removed from the gate, there is no reason for modifying Righi in order to form the insert of a “better material” in terms of toughness, hardness, and/or thermal conductivity.

In addition, the applicant respectfully disagrees that a disclosure in CN ‘362Y of the inner sheath 2 (cavity forming member) being formed of a material that is more high temperature resistant than the material of the die body 1 (main body) meets the limitation recited by the applicant in which the thermal conductivity of the cavity forming member is better than the main body, since temperature resistance and thermal conductivity are not interchangeable physical properties. However, the applicant notes that the Examiner also considers the CN ‘362Y reference to disclose improved hardness properties. This feature is not disclosed in the English language translation of the Office Action provided by the Chinese Patent Office, but appears meet the broadly recited limitation of “a material which is better with respect to at least one of toughness, hardness, and thermal conductivity,” as claimed.

Upon review of Kumpula, the applicant finds that Kumpula discloses a precipitate-hardened maraging steel having high strength, good ductility, small thermal expansion coefficient, good

thermal conductivity and significantly better thermal stability than other maragaing steels. The preferred field use for the inventive steel is as a mold material for pressure casting of light metal alloys.

The applicant respectfully disagrees with the rejection of claims 5 and 6 as unpatentable over Righi in view of Kumpula, since neither Righi nor Kumpula suggest or disclose forming the insert of a material which is different than that of the die main body. Righi clearly discloses forming the insert of the same material as the die body (col. 7, lines 13-20). Kumpula discloses a steel having properties which are suited for use in forming a mold, but does not consider or suggest forming a composite mold of one or more materials. The applicant respectfully asserts that modification of Righi by the teachings of Kumpula would result merely in an invention in which both the die main body 2 and the inserts 30, 32 of Righi are formed of the improved maraging steel of Kumpula. Such a modification does not meet, or make obvious, the claimed invention in which a portion of the die, that is the cavity forming member, is made of a material which is better than the steel used to form the main body.

In this regard, the applicant notes that the above distinction is significant in that the die according to the invention can be produced more efficiently and inexpensively, thus reducing the cost of parts subsequently formed using the die, as discussed in the application.

Although the applicant disagrees with the Examiner's rejection for the reasons stated above, in order to promote the prosecution of the application, the applicant has amended claims 5 and 6 herein to recite that the cavity forming member is one of a) deposited by welding onto a face of the mold cavity and b) fitted in or joined to the mold cavity. These features are not suggested or disclosed in the cited prior art, as discussed below with respect to the rejections of claims 7 and 10. As such, reconsideration and withdrawal of the rejections are respectfully requested.

As regards claims 7-12, the applicant respectfully disagrees with the rejections of claims 7-9

for the reasons stated above with respect to claim 5 from which claims 7-9 depend, and with the rejections of claims 10-12 for the reasons stated above with respect to claim 6 from which claims 10-12 depend.

As particularly regards claims 7 and 10, none of the cited references discloses cavity forming member comprising an overlay deposited by welding. Righi states that the heat exchanging insert 30, 32 consists of an outer shell which is secured by welding to a pair of internally-disposed core members so as to facilitate firm mechanical interengagement therebetween (col. 7, lines 14-17; col. 8, lines 27-38). However, Righi does not disclose how the insert is connected to the die main body. As regards the disclosure of CN '362Y with respect to insert 2 and die body 1, based on the information available, it is believed that the cited reference does not disclose the claimed feature.

Although the applicant disagrees with the Examiner's rejection for the reasons stated above, in order to promote the prosecution of the application, the applicant has amended claims 7 and 10 to more clearly recite that the overlay is formed by placing a welding deposit on a face of the mold cavity, to distinguish the invention from one which is merely a weld joint connecting two separate bodies. Forming an overlay by means of a welding deposit is not suggested or disclosed in the prior art.

As further regards claims 9 and 12, the applicant respectfully disagrees that Righi or CN '362Y disclose a mold cavity that is bent or curved from a gate. Fig. 1 of Righi disclose the gate 6 as disposed linearly downstream of the curve 5 in the mold cavity, and CN '362Y does not disclose a curve within the mold cavity. In addition, the applicant disagrees that either reference discloses the cavity forming member disposed in a position closest to the gate, since Righi discloses the insert 30 to be disposed downstream of the casting member flange identified by reference number 15, and thus cannot be considered as "in a position closest to said gate" as claimed. In addition, CN '362Y does not disclose a gate.

At item 5 of the Office Action, the Examiner rejected claims 1 and 3-4 under 35 103(a) as being unpatentable over Righi in view of Kumpula and further in view of Suzuki et al (US 4,497,359). In the rejection, the Examiner states that Righi in view of Kumpula fail to teach the use of hot tool steel such as SKD steel for the die main body. The Examiner cites Suzuki as teaching the use of hot tool steel such as SKD steel for the die main body for the purpose of improving casting quality in a die casting method, and considers it obvious to further modify Righi in view of Kumpula to use hot tool steel such as SKD as taught by Suzuki.

Applicant's Response

Upon review of Suzuki, the applicant finds that Suzuki discloses a die-casting method in which a die cavity including a runner comprises a squeeze passage including a squeeze plunger, whereby the plunger is used to forcibly compress molten metal within the die cavity. The disclosed method reliably produces void-less die-cast products. Suzuki discloses a fixed die 18 having an impression block 20 formed of hot tool steel (SKD 61), and a movable die 26 having a core 28 formed of a hot tool steel (SKD 61).

The applicant respectfully disagrees with the rejection of claims 1 and 3-4 as unpatentable over Righi in view of Kumpula, and further in view of Suzuki, since neither Righi nor Kumpula suggest or disclose forming the insert of a material which is different than that of the die main body. As discussed above, Righi clearly discloses forming the insert of the same material as the die body (col. 7, lines 13-20). Kumpula discloses a steel having properties which are suited for use in forming a mold, but does not consider or suggest forming a composite mold of one or more materials. The applicant respectfully asserts that modification of Righi by the teachings of Kumpula would result merely in an invention in which both the die main body 2 and the inserts 30, 32 of Righi are formed of the improved maraging steel of Kumpula. Such a modification does not meet, or make obvious, the claimed invention in which the cavity forming member is made of a material which is better than the steel used to form the main body.

The applicant further submits that, although Suzuki teaches use of SKD steels to form a

die body, Suzuki does not cure the deficiencies discussed above with respect to Righi and Kupula. That is, there is no suggestion or disclosure in Suzuki to provide a main body formed of steel (SCM or SKD steel), and a cavity forming member formed of a better steel (maraging or SKH steel). Since none of the cited references suggest or disclose the claimed feature, it appears that the Examiner is using improper hindsight to formulate the rejection.

Although the applicant disagrees with the Examiner's rejection for the reasons stated above, in order to promote the prosecution of the application, the applicant has amended claim 1 herein to recite that the cavity forming member is formed integrally with the main body. This feature is supported in the specification at paras. 32 and 37, in which it is disclosed that the cavity forming member is joined to the main body by welding, or specifically, comprises a welding deposit overlay. This feature is not suggested or disclosed in the cited references, and reconsideration and withdrawal of the rejection is respectfully requested.

Conclusion

The applicant respectfully submits that all of the above amendments are fully supported by the original application. The applicant also respectfully submits that the above amendments do not introduce any new matter into the application or raise new matters for consideration by the Examiner.

Based on all of the foregoing, the applicant respectfully submits that all of the objections and rejections set forth in the Office Action are overcome, and that as presently amended, all of the pending claims are believed to be allowable over all of the references of record, whether considered singly or in combination. The applicant requests reconsideration and withdrawal of the rejection of record, and allowance of the pending claims.

If any issues remain unresolved, the applicant respectfully requests that the Examiner telephonically contact the applicant's undersigned representative to expeditiously resolve prosecution of the application.

Favorable consideration is respectfully requested.

Respectfully submitted,



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